REMARKS/ARGUMENTS

Reconsideration and continued examination of the above-identified application are respectfully requested.

Full support for the supplemental amendment can be found throughout the present application, for instance, at page 6, line 15, to page 7, line 2, and Figure 1. Accordingly, no questions of new matter should arise and entry of the amendment is respectfully requested.

Claims 9-14 continue to be withdrawn as the result of an earlier restriction requirement.

Rejection of claims 1 - 8 under 35 U.S.C. §112, second paragraph

At page 2 of the Office Action, the Examiner rejected claims 1 - 8 under 35 U.S.C. §112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which the applicants regard as the invention. More specifically, the Examiner alleged that in claim 1, it is unclear which carbon black the term "a carbon black" is referencing. For the following reasons, this rejection is respectfully traversed.

Claim 15 of the present application relates to a process of producing carbon black in which off-gas from a carbon black furnace is used in a combustion gas feed stream in the process. Since the off-gas used in the process is obtained from a carbon black furnace, it initially contains some already-produced carbon black, which is removed from the off-gas before it is used in the present process. Thereafter, in the present process, the off-gas is used as a combustion gas in the carbon black furnace to produce additional carbon black. Accordingly, to distinguish the carbon black produced by the claimed method from the carbon black originally present in the off-gas, claim 15 uses the term "existing carbon black" to describe the carbon black that may be already present in the off-gas at the start of the process or at the start of a new cycle of the process. This distinction

between the initial or existing carbon black and the carbon black produced according to the present method would be clear to persons skilled in the art. Therefore, this rejection should be withdrawn.

Rejection of claims 1 and 2 under 35 U.S.C. §103(a) over Rothbuhr et al.

At page 2 of the Office Action, the Examiner rejected claims 1 and 2 under 35 U.S.C. §103(a) as being unpatentable over Rothbuhr et al. (U.S. Patent No. 4,636,375). The Examiner alleged that Rothbuhr et al. teaches treating carbon black off-gas to remove water and carbon, then recycling it. The Examiner acknowledged that Rothbuhr et al. does not explicitly teach heating before recycling, but alleged that this would be obvious to increase the carbon yield or efficiency of combustion. The Examiner alleged that a fuel rich mode is suggested as an option and that the examples at col. 9, lines 60 - 63 show less combustion. At page 4 of the Office Action, the Examiner further alleged that added language to claim 1 does not recite that the present process is a fuel-rich process and that the claims and previous arguments do not draw a distinction between complete combustion of the fuel, versus an excess of oxygen to react with the feedstock. For the following reasons, this rejection is respectfully traversed.

Independent claim 15 of the present application relates to a furnace carbon black-producing process wherein off-gas from a carbon black furnace is dewatered and heated, following substantial removal of carbon black therefrom, and fed as at least a part of a combustion gas feed stream to a burner portion of the carbon black furnace. The new claim explicitly provides that the combustion gas feed stream and the oxidant gas feed stream are controlled to provide a fuel-rich condition so that the combustion gas does not completely combust in the burner portion of the carbon black furnace. Further, the claim describes the carbon black furnace as being a type in which a combustion gas is combusted in the presence of an oxidant gas in a burner portion of the furnace to

produce hot combustion gases and then the hot combustion gases interact with a hydrocarbon feedstock in a reactor portion of the furnace. Therefore, claim 15 explicitly recites that the claimed process is fuel-rich and clarifies that the characterization of the process as fuel-rich includes the combustion of the combustion gas feed stream in the presence of the oxidant gas feed stream in the burner portion of the furnace.

As discussed in Applicants' previous responses, Rothbuhr et al. does not teach or suggest any instance in which a fuel-rich condition is used in a process wherein an off-gas is recycled. In particular, col. 1 of Rothbuhr et al. describes the effects varying the parameters of the amount of combustion air (the "oxidant gas" in the present claims), fuel gas (the "combustion gas feed stream" in the present claims) and carbon black raw material (the "hydrocarbon feedstock" in the present claims) and states, at column 1, lines 45-48, that "[t]he fuel gas required for energy production (or some other fuel) is mostly employed in such volumes, related to the volume of oxygen introduced with the combustion air, that it is present in deficiency." One skilled in the art, by reading Rothbuhr et al., at col. 1, lines 45-48, would clearly understand that it is the fuel gas that is present in deficiency. Thus, the process described at col. 1, lines 45-48, is a fuel-lean process, which teaches away from the claimed invention.

Rothbuhr et al., at col. 1, lines 49-52, also states that "...it is one of the principles of the furnace black process that the volume of oxygen is used in deficiency relative to the fuel <u>and</u> carbon black raw material volume." (Emphasis added) In other words, the volume of oxygen is less than the combined volume of fuel <u>and</u> carbon black raw material. If the volume of oxygen is equal to or more than the combined volume of fuel and carbon black raw material, the oxygen would completely burn the carbon black raw material and the process would <u>not</u> result in production of a carbon black. The statement at col. 1, lines 49-52, does not indicate that the volume of oxygen is

less than the volume of fuel by itself. In fact, one skilled in the art, by reading Rothbuhr et al., at col. 1, lines 49-52, in view of Rothbuhr et al., at col. 1, lines 45-48, would conclude that the amount of oxygen is more than the amount of fuel, but not more than the combined amount of fuel and carbon black raw material. In claim 15 of the present invention, on the other hand, it is clearly specified that the fuel-rich condition occurs in the burner portion of the carbon black furnace as a result of controlling the combustion gas feed stream and the oxidant gas feed stream.

In addition, Rothbuhr et al., at col. 1, lines 52-56, states that "...whenever as little as possible air-oxygen is to come into contact with the carbon black raw material and is to burn the latter, as high volumes as possible as fuel gas are used." The statement at col. 1, lines 52-56, on its face, would appear to indicate a trend to run a process wherein the amount of fuel reaches or approaches stoichiometric. However, although col. 1, lines 52-56, indicates an increase in the amount of fuel, according to Rothbuhr et al., at col. 1, lines 58-62, the amount of fuel cannot be greater than the amount of oxygen because such a process would damage the liner of the reactor. See Rothbuhr et al., wherein Rothbuhr et al. teaches away from having a fuel-rich process by stating, at col. 1, lines 58-62, that a high amount of fuel leads to higher temperature loads, which can destroy the inner liner of the reactor. For the reasons set forth above, Rothbuhr et al. at col. 1, lines 45-63, clearly describes a fuel-lean process.

Moreover, Rothbuhr et al., at cols. 7 and 8, further emphasizes the production of carbon black using a <u>fuel-lean</u> process by stating that the process includes an air volume constant of 27 Nm^3/h and a natural gas constant of 1.9 Nm^3/h. One skilled in the art would recognize that an air volume constant of 27 Nm^3/h and a natural gas constant of 1.9 Nm^3/h relate to a fuel-lean process.

Moreover, in several other places, Rothbuhr et al. clearly characterizes its process as being a fuel lean process. See, for example, col. 3, lines 47 - 60 and col. 9, lines 45 - 49.

PAGE 11/20 * RCVD AT 1/6/2006 11:18:22 AM [Eastern Standard Time] * SVR:USPTO-EFXRF-6/36 * DNIS:2731351 * CSID:5404281720 * DURATION (mm-ss):07-58

Since the claimed invention relates to a process using a fuel-rich process and Rothbuhr et al. uses a fuel lean process, Rothbuhr et al. does not teach or suggest the invention of claim 15. Moreover, Rothbuhr et al. does not teach or suggest deep rich fuel conditions or a process in which the heated, dewatered off-gas is the only combustible gas supplied to the burner of a carbon black furnace as required by dependent claim 2. Accordingly, the rejection under 35 U.S.C. §103(a) over Rothbuhr et al. should be withdrawn.

Rejection of claims 1 and 2 under 35 U.S.C. §103(a) over Stokes

At page 2 of the Office Action, the Examiner rejected claims 1 and 2 under 35 U.S.C. §103(a) as being unpatentable over Stokes (U.S. Patent No. 2,672,402) alone or in view of Rothbuhr et al. The Examiner alleged that Stokes teaches removing carbon and water from carbon black off-gas, recycling the off-gas and injecting oxygen. The Examiner alleged that Stokes differs only in not teaching heating the dewatered gas. The Examiner alleged that this would be obvious as a measure to maintain the temperature, in view of maintaining a favorable equilibrium as well as to maintain a hot combustion zone for efficient burning and carbon formation. The Examiner alleged that preheating is an obvious measure to improve economic efficiency, as allegedly taught by Rothbuhr et al., and that Stokes teaches or suggests a fuel rich mode. For the following reasons, this rejection is respectfully traversed.

The present invention relates to a furnace carbon black-producing process wherein off-gas from a carbon black furnace is dewatered and heated, and then, after carbon black is substantially removed therefrom, the off-gas is fed as at least a part of a combustion gas feed stream to a burner portion of the carbon black furnace. New claim 15 explicitly clarifies that the combustion gas feed stream and the oxidant gas feed stream are controlled to provide a fuel-rich condition so that the

combustion gas docs not completely combust in the burner portion of the carbon black furnace. Further, the claim explicitly clarifies that the carbon black furnace is a type in which a combustion gas in combusted in the presence of an oxidant gas in a burner portion of the furnace to produce hot combustion gases and then the hot combustion gases interact with a hydrocarbon feedstock in a reactor portion of the furnace to form carbon black. As described for example at page 1 of the present specification, carbon black is produced in this process by pyrolysis of the hydrocarbon feedstock effected by the interaction with the hot combustion gases.

Stokes, on the other hand, relates to a substantially different process from that described and claimed in the present invention. In Stokes, a liquid hydrocarbon feedstock, referred to as a "make material," and oxygen are both delivered to the same burner nozzle of a carbon black furnace. The hydrocarbon feedstock and recycled tail gas arc burned together in the furnace, and carbon black is produced by incomplete combustion of the hydrocarbon feedstock upon the complete consumption of the oxygen. In such a process, a low volume of oxygen is essential to the process to prevent the complete combustion of the hydrocarbon feedstock, which in the apparatus of Stokes would be a likely possibility since the oxygen is delivered to the same burner nozzle as the hydrocarbon feedstock. Stokes does not teach or suggest the process of the present invention wherein first a combustion gas feed stream is combusted in the presence of an oxidant gas in a burner portion and then the hot combustion gases interact with a hydrocarbon feedstock in a reactor portion to form a carbon black. Because of the substantial difference in the manner in which carbon black is produced, Stokes provides no relevant teaching as to whether a lean fuel condition or a rich fuel condition should be used in such a process. Accordingly, Stokes does not teach or suggest the method of the present invention.

The arguments set forth above with respect to Rothbuhr et al. apply equally here. In

summary, Rothbuhr et al. teaches away from the claimed invention by describing a fuel-lean process. Because Stokes describes a substantially different process from that described in Rothbuhr et al. as well, a person skilled in the art would not look to the teachings of Stokes to modify the process of Rothbuhr et al. In other words, Stokes provides absolutely no guidance as to whether a lean fuel condition or a rich fuel condition should be used in any process other than one in which carbon black is produced directly by incomplete burning of a hydrocarbon feedstock in a burner and wherein oxygen and a hydrocarbon feedstock are both supplied to a burner through the same burner nozzle. Moreover, as discussed in Applicant's previous response, and as acknowledged by the Examiner, Stokes does not teach or suggest dewatering and heating off-gas from a carbon black furnace prior to recycling the off-gas.

Accordingly, the rejection under 35 U.S.C. §103(a) over Stokes alone or in view of Rothbuhr et al. should be withdrawn.

Rejection of claims 3 and 8 under 35 U.S.C. §103(a) over Stokes alone or with Rothbuhr et al., and further in view of Sircar and Doshi

At page 3 of the Office Action, the Examiner rejected claims 3 and 8 under 35 U.S.C. §103(a) as being unpatentable over Stokes alone or with Rothbuhr et al., and further in view of Sircar (U.S. Patent No. 5,240,472) and Doshi (U.S. Patent No. 4,690,695). The Examiner alleged that Stokes describes removal by adsorption in general, while acknowledging that Stokes does not specify pressure swing absorption (PSA). However, the Examiner alleged that Sircar, at col. 5, line 55, describes using PSA to dewater a gas. Thus, the Examiner took the position that it would be obvious to use the water removal system of Sircar in Stokes. With respect to claim 8, the Examiner

PAGE 14/20 * RCVD AT 1/6/2006 11:18:22 AM [Eastern Standard Time] * SVR:USPTO-EFXRF-6/36 * DNIS:2731351 * CSID:5404281720 * DURATION (mm-ss):07-58

acknowledged that Stokes does not identify the source of oxygen; however, the Examiner alleged that Doshi, at col. 11, line 5, describes that its process can separate oxygen by PSA. Thus, the Examiner took the position that using oxygen from any source, such as PSA, is an obvious expedient to create the oxygen used by Stokes. For the following reasons, this rejection is respectfully traversed.

As discussed above, Stokes and Rothbuhr et al., alone or in combination, do not teach or suggest the limitations of independent claim 15. In particular, Rothbuhr et al. does not teach or suggest any instance in which a fuel-rich condition is used in a process wherein an off-gas is recycled, but rather teaches producing carbon black in a fuel-lean condition. Moreover, regarding Stokes, the differences between the process of producing carbon black according to Stokes and the process of the present invention are so substantial that any teachings in Stokes regarding the amount of oxygen used in its process are not relevant to the process of the present invention. In particular, Stokes does not teach or suggest any process wherein first a combustion gas feed stream is combusted in the presence of an oxidant gas in a burner portion and then the hot combustion gases interact with a hydrocarbon feedstock in a reactor portion to form a carbon black. Rather, Stokes relates to a process in which a liquid hydrocarbon feedstock and oxygen are both delivered to the same burner nozzle of a carbon black furnace and the hydrocarbon feedstock and a tail gas are burned together in the furnace. Sircar and Doshi do not relate to carbon black producing processes and do not overcome the deficiencies of Stokes and Rothbuhr et al. described above. Therefore, claims 3 and 8 are allowable for the same reasons that independent claim 15 is allowable over Rothbuhr et al. and Stokes, as discussed above. Further, regarding the specifics of claims 3 and 8, and with respect to the Examiner's comment that if the applicants claim a PSA process then any PSA reference is considered analogous, the applicants respectfully disagree. Sircar, at col. 5, lines

52-56, states that residual water and carbon dioxide can be removed from a nitrogen-containing gas stream, such as air, by methods such as PSA. Given that Sircar specifically recites that PSA is used to remove residual water in a nitrogen-containing gas and, according to Stokes, its tail-gas does not include nitrogen, one skilled in the art would not be motivated to combine the teachings of Sircar with Stokes to remove the water vapor of Stokes by PSA. Therefore, Sircar and Stokes are non-analogous art. The Examiner has not provided any proper motivation why one skilled in the art would look to Sircar for PSA. Certainly, none of the primary references have provided any motivation and Sircar does not relate to carbon black. With respect to Doshi, this patent relates to a permeable membrane for initial bulk gas separations which makes use of a pressure swing adsorption system. From a reading of Doshi, there is no teaching or suggestion of using this system in the manufacturing of carbon black. Accordingly, Doshi is also non-analogous art with respect to the claimed invention and, furthermore, one skilled in the art would not look to Doshi and combine it with the production of carbon black patents relied upon by the Examiner, including Stokes and/or Rothbuhr et al. The only motivation that one would have for applying this technology to carbon black would be through the use of hindsight or an obvious to try standard, both of which are improper for purposes of determining patentability.

Accordingly, the rejection under 35 U.S.C. §103(a) over Stokes alone or with Rothbuhr et al. and further in view of Sircar and Doshi should be withdrawn.

Rejection of claims 4 - 7 under 35 U.S.C. §103(a) over Stokes alone or in view of Rothbuhr et al. and further in view of Lynum et al.

At page 3 of the Office Action, the Examiner rejected claims 4 - 7 under 35 U.S.C. §103(a) as being unpatentable over Stokes alone or in view of Rothbuhr et al. and further in view of Lynum

PAGE 16/20 * RCVD AT 1/6/2006 11:18:22 AM [Eastern Standard Time] * SVR:USPTO-EFXRF-6/36 * DNIS:2731351 * CSID:5404281720 * DURATION (mm-ss):07-58

et al. (U.S. Patent No. 5,527,518). The Examiner acknowledged that Stokes and Rothbuhr et al. do not explicitly teach reheating the recycled gas using plasma heating. However, the Examiner alleged that Lynum et al. teaches reheating the recycled gas using plasma heating to make carbon blacks. The Examiner took the position that plasma preheating the gases of Stokes would be obvious to assure efficient combustion and restore heat lost during the water-removal steps. For the following reasons, this rejection is respectfully traversed.

As discussed above, Stokes and Rothbuhr et al., alone or in combination, do not teach or suggest the limitations of independent claim 15. In particular, Rothbuhr et al. does not teach or suggest any instance in which a fuel-rich condition is used in a process wherein an off-gas is recycled, but rather teaches producing carbon black in a fuel-lean condition. Moreover, as discussed above, the differences between the process of producing carbon black according to Stokes and the process of the present invention are so substantial that any teachings in Stokes regarding the amount of oxygen used in its process are not relevant to the process of the present invention. Lynum et al. does not overcome these deficiencies of Stokes and Rothbuhr et al. Therefore, claims 4 - 7 are allowable for the same reasons that independent claim 15 is allowable over Rothbuhr et al. and Stokes, as discussed above. Moreover, regarding claims 4 - 7, Lynum et al. relates to passing a preheated feedstock of methane and/or natural gas through a plasma torch to cause a pyrolytic decomposition of the feedstock. Thus, Lynum et al. does <u>not</u> teach or suggest recycling the off-gas, and further plasma heating of the off-gas which has been preheated to a certain degree via a suitable heat exchanger. According to Lynum et al., a plasma torch increases the temperature of the feedstock to the decomposition temperature for the raw material. This temperature is too high to be used for merely preheating the feedstock. Lynum et al. does not teach that the gases transported in a return pipe to the torch are preheated. Thus, one skilled in the art, by reading Lynum et al., would

not use a plasma torch to preheat a recycled feedstock of Stokes, or to heat an oxidant gas feed stream, to preheat the combustion gases produced in a burner portion of the same, or to preheat the combustion gases produced in a burner portion of a different carbon black furnace. Instead, one skilled in the art, by reading Lynum et al. in view of Stokes, would conclude that a plasma torch is only used to decompose the feedstock instead of preheating the feedstock. Accordingly, one skilled in the art, by reading Stokes alone or in view of Rothbuhr et al. and in view of Lynum et al., would not select the elements from the three references for combination in a manner claimed by the applicants. The only way this rejection can be made is by the improper use of hindsight, by the improper use of an obvious to try standard, and/or by the manipulation of the references in a manner not taught or suggested by the references.

Accordingly, the rejection under 35 U.S.C. §103(a) over Stokes alone or with Rothbuhr et al. and further in view of Lynum et al. should be withdrawn

Rejection of claim 1 under 35 U.S.C. §103(a) over Morel

At page 3 of the Office Action, the Examiner rejected claim 1 under 35 U.S.C. §103(a) as obvious over Morel (U.S. Patent No. 3,438,732). The Examiner alleged that Morel teaches making carbon black and recycling the effluent. The Examiner acknowledged that Morel does not require preheating of the off-gas, but suggests preheating to optimize efficiency. The Examiner further states that the stream does not combust. The Examiner took the position that it would have been obvious to preheat the recycle in the process of Morel to improve the process. For the following reasons, this rejection is respectfully traversed.

The present invention, as set forth in independent claim 15, relates in part to a process in which off-gas is recycled as a combustion gas feed stream to a burner portion of a carbon black

furnace. Morel, on the other hand, describes a process in which a tail gas in a carbon black process is treated for the removal or combustion of combustible materials and then the inert or neutral remaining gas is recycled into a combustion chamber. Morel does not teach or suggest a process wherein a dewatered and heated off-gas or tail gas is fed as part of at least a combustion gas feed stream to a burner portion of a carbon black furnace. In Morel, the tail gas is not recycled and used a combustion gas feed stream, since all combustible material has been removed from the gas at the time that it enters the combustion chamber.

Accordingly, the rejection under 35 U.S.C. §103(a) over Morel should be withdrawn.

Separate argument for allowability of claim 18

Moreover, regarding all of the rejections over the cited art discussed above, none of the applied references teach or suggest any method of using off-gas from a carbon black furnace in a combustion gas feed stream of a different carbon black furnace as set forth in new independent claim 18.

The Examiner is respectfully requested to contact the undersigned by telephone should there be any remaining questions as to the patentability of the pending claims.

CONCLUSION

In view of the foregoing remarks, the applicants respectfully request the reconsideration of this application and the timely allowance of the pending claims.

If there are any fees due in connection with the filing of this response, please charge the fees to Deposit Account No. 03-0060. If a fee is required for an extension of time under 37 C.F.R. § 1.136 not accounted for above, such extension is requested and should also be charged to said

PAGE 19/20 * RCVD AT 1/6/2006 11:18:22 AM [Eastern Standard Time] * SVR:USPTO-EFXRF-6/36 * DNIS:2731351 * CSID:5404281720 * DURATION (mm-ss):07-58

Deposit Account.

Respectfully submitted,

Luke A. Kilyk
Reg. No. 33,251

Atty. Docket No. 97116CIP (3600-340)
KILYK & BOWERSOX, P.L.L.C.
400 Holiday Court, Suite 102
Warrenton, VA 20186
Tel.: (540) 428-1701
Fax: (540) 428-1720

PAGE 20/20 * RCVD AT 1/6/2006 11:18:22 AM [Eastern Standard Time] * SVR:USPTO-EFXRF-6/36 * DNIS:2731351 * CSID:5404281720 * DURATION (mm-ss):07-58